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(54) WARM WATER DELIVERY DEVICES

(57) The flow of water from a warm water delivery device (1) is determined by a thermostatically controlled valve member (24) which cooperates with a valve seat (23) in an outlet conduit (11) to close the valve when water passing through the conduit has a temperature higher than a preestablished temperature level and to maintain open the valve when the water temperature is below the preestablished level. The device (1) particularly constitutes a mixing valve bath/shower fawcet unit.

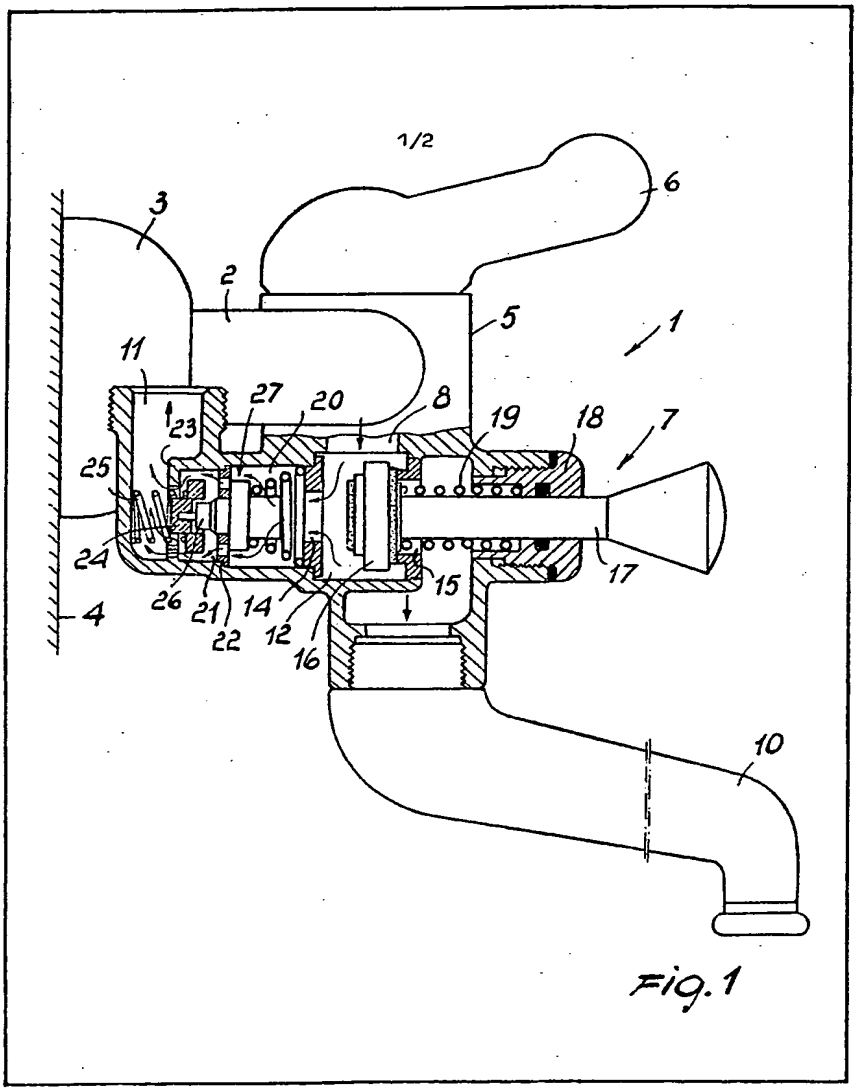

Fig. 1

GB 2 003 582 A

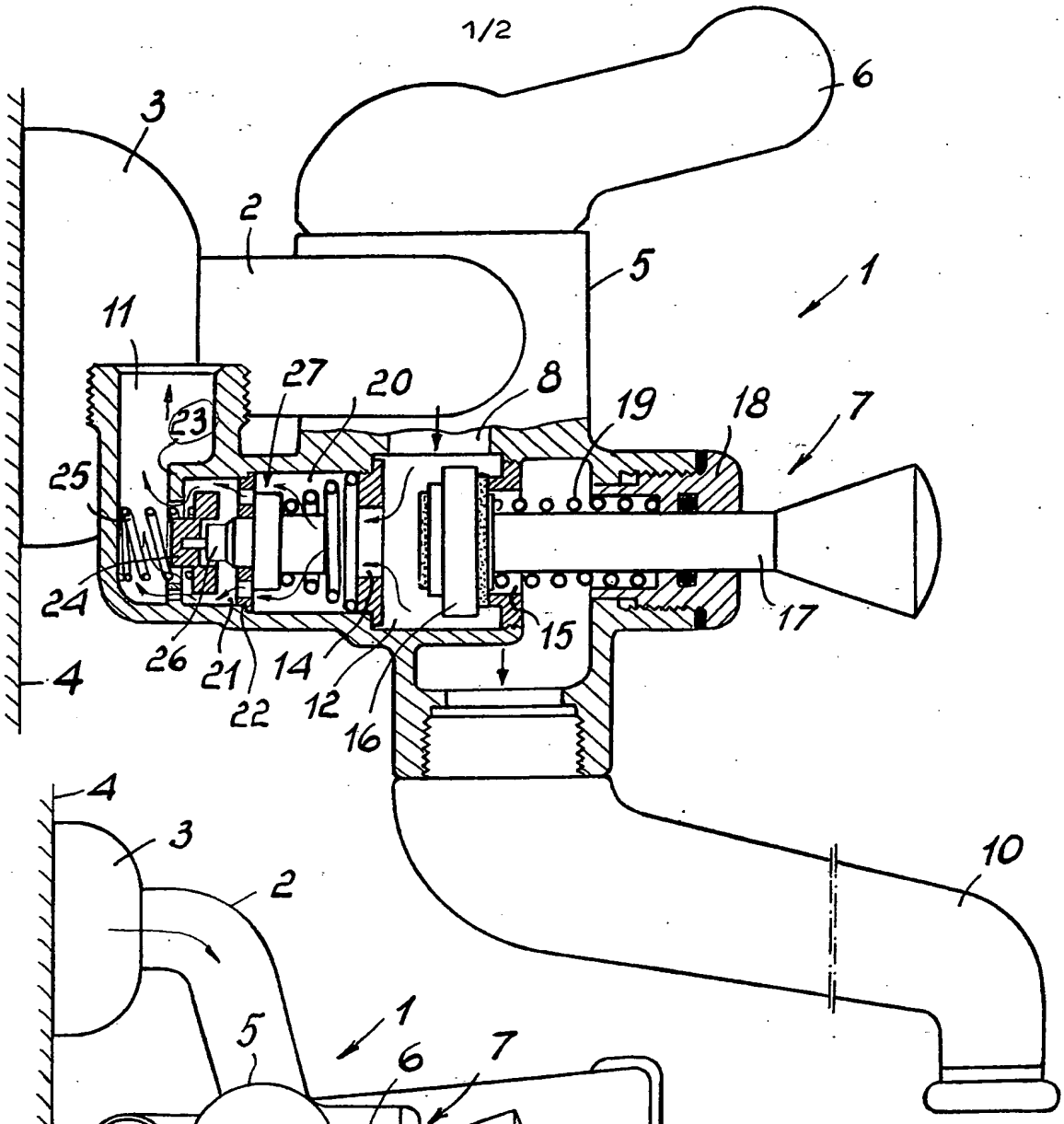
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Fig. 1

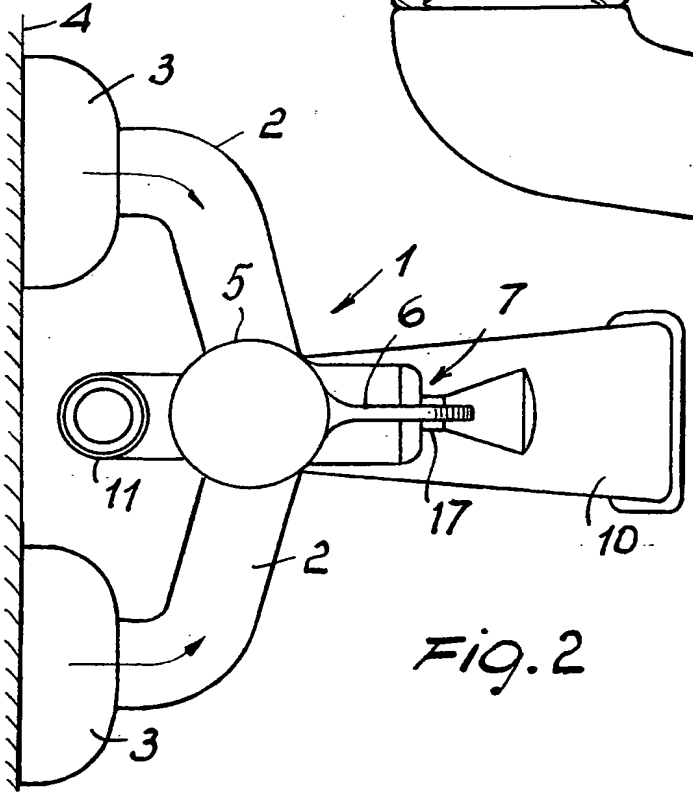
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Fig. 2

SPECIFICATION

WARM WATER DELIVERY DEVICES

This invention relates to a warm water delivery device, particularly for faucet valves and more specifically to a device wherein two water streams, a cold one and a hot one, are mixed together and delivered.

A typical application of such dispensing sets is in home appliances, for sinks, bathtubs and shower baths. There, the traditional two separated taps or faucets for hot and cold water have been since some time replaced of preference with two paired taps having a single inlet for receiving water at the desired temperature. The design development of such sets has been directed to uniting the two taps or faucets in a single device, such that, by operating a single lever or knob, the overall flow rate for a given temperature, and temperature for a given flow rate, could be adjusted independently by varying the ratio thereof. A mixing valve of this type has been disclosed in U.S. Patent No. 3,169,549.

The practical advantages thus achieved are substantial: with a single knob to be operated one hand is left free to feel at once the effects of the adjustment carried out, but what is more important is that, in an adjusting process, it has been found greatly advantageous to be able to vary independently those two parameters of temperature and overall flow rate, which was difficult to accomplish with two independent taps or faucets. Naturally, if a single tap or faucet can be improved, the more so will single control dispensing sets, which form an elaborated assembly and may create problems still restricting their application, notwithstanding the wide acceptance that they enjoy in principle. Among the various drawbacks which affect them, one is so serious that some governments have enforced special safety laws and regulations which either forbid or restrict the use of shower bath having a single control knob or lever, that is the possibility that the delivery or dispensing temperature be adjusted too sharply, causing scorch hazard. In fact, the single control is generally implemented as a lever which when moved along meridians adjusts one parameter, and when moved along parallels adjusts the other parameters. In other words, jerks or an operational error, as made absent-mindedly, for instance, is sufficient to cause temperature to jump to dangerously high values, since the hot water supply can be as high as 90—95°C. This hazard is somewhat attenuated with separated taps or faucets, provided that fine pitch screw thread taps are selected, such that more turns are required to command a high temperture range.

It is a general object of this invention to provide a dispensing or delivering set effectively eliminating the hazard from accidental delivery of excessively hot water.

Another object is that of providing such a dispensing set using means of simple design and readily available on the market.

These objects are achieved by a warm water delivery device, comprising warm water supply conduits, warm water delivery conduits and valve means between said supply and delivery conduits, wherein according to the improvement one of said warm water supply and delivery conduits has a valve seat in the interior thereof and defining a valve opening therein allowing water passage therethrough, a valve member cooperating with said valve seat to close and open said valve opening and thereby prevent or allow water passage therethrough, a temperature responsive thermostatic element within said one conduit near said valve member and operatively connected therewith to shift it in its closed position to prevent water passage therethrough when said water passing through said conduit has a temperature higher than a preestablished temperature level and maintain open said valve member when said water temperature is below said preestablished level.

The features, mode of operation, and advantages of the invention will be explained more in detail in the following description of a presently preferred embodiment thereof, given herein by way of illustration and not of limitation, with reference to the accompanying drawings, where:

Figure 1 is a side view, partly sectional, of a blending dispensing set according to this invention;

Figure 2 is a plan view of the same set, in a reduced scale;

Figure 3 is a detail of Figure 1, shown in section and at a different stage; and

Figure 4 is a variation of the detail of Figure 1.

A combination mixing dispensing set incorporating the invention is shown installed in a bath appliance in Figures 1 and 2, and is generally indicated at 1. The set is assumed to be of the type for bathtub and shower, and comprises additionally a two-way valve communicating to the tub or shower. Two conduits 2 supplying respectively cold and hot water secure the set to two sockets with fittings covered by bosses 3, in the wall 4, for example above a bathtub. The two conduits lead into a faucet valve body 5, including a mixing valve of any suitable known type, whereof only the single control knob 6, is shown. Such mixing valve may be e.g. of the type disclosed in the U.S. Patent No. 3,169,549.

That same body 5 accomodates a two-way switch valve 7, also of any known type, which directs the water, mixed by the mixing valve, from the inner conduit 8 and hence to the outlet spout 10, or to the shower supply conduit 11, as shown by the arrows. The switch valve 7 shown, comprises a switching chamber 12, whereto the conduit 8 opens wherein there are defined two openings 14 and 15 onto the edges whereof is rested, alternatively, a plate shutter 16, actuated by the stem 17, in turn guided in sealed engagement by the packing gland 18 and urged by the spring 19. The switch valve 7 is maintained in

the position shown in the drawing by water pressure existing in the switching chamber when the faucet valve is open, as is wellknown in the art.

From the switching chamber 12 to the conduit 11, the following components are arranged in succession within the body 5: a first cylindrical space 20 and a second cylindrical space 21, which are separated from each other by a perforated partition 22 with bearing functions. A wall 23, also perforated, constituting a valve seat, divides the first space 20 from the delivery conduit 11. The wall or valve seat 23 is open and closed by a disc valve 24 which is the safety valve or relief valve of the invention, it being held open by a spring 25 and rigid with a stem 26 of a thermostatic element 27 of thermal threshold sensor-transducer type, which is an element effective to convert a thermal variation into a mechanical displacement capable of shifting the valve 24 from its fully open position to a closed one, as a given temperature is reached. The thermostatic elements shown in Figures 1 and 3 are geometrically different, but of the same type, that is of the isothermal phase transformation type. Thermostatic elements of this type are manufactured for instance under the license from Vernay Laboratories, by the French company Vernet Division de Calorstat of Ollainville, France suitable for the purpose are for example models identified with code No. 187 566023 and 187 606423. With reference to Figure 3, where the element 27 is shown in section, it may be seen to comprise a casing 28 wherefrom there projects a tubular guide 29 wherein the stem 26 of the valve 24 is mounted slidably. The casing is filled with a low-melting substance 30 having a well defined melting point, comparatively low melting heat, and an appreciable volume increase on melting. The edges of the casing are bordered and affixed to the tubular guide 29, in line therewith, with the interposition of an elastic membrane 31. The membrane performs the function of following the expansion movements of the substance 30. A dampening plug 32 transmits the motion of the membrane 31 to the stem 26 and valve 24. The element is rested against the perforated partition 22 and is held in position by a relieving spring 33, definitely stronger than the spring 25 of the valve. However, the relieving spring 33 can allow a recoil of the element 27 with detachment from the perforated partition 22 as the valve 24 abuts against its seat and the excess thermal expansion continues, thereby if left without a relief it could damage the element. The low-melting substance is preferably a wax based composition, known per se, wherein the melting point is defined by the percent amounts of the elements defining the composition itself.

Provision is suitably made in the valve seat 23, according to a further improvement of the invention, for a small hole 34, in parallel and at all times open, to permit a small non-dangerous flow allowing exchange of water and accordingly a quick restart of the system, when the temperature in the chamber 20 becomes lower than the threshold temperature owing to the flow of fresh water through the hole 34, as will be described later.

Figure 4 shows one of the possible variations of the thermal transducer 27, which in this instance is not of the melting type but a thermal trip bimetallic disk design, indicated at 27' and rested through a spacer 35 onto the edges of the opening 14. Since the disk element is inherently resilient, the relieving spring 33 can be omitted. For the remaining portions, the arrangement is unaltered.

The invention operates as follows. Assuming the two-way switch valve 7 to be in the position shown in the figures, allowing flow to the shower, the water mixed in the mixing valve controlled by the single lever 6 is passed from the switching chamber 12 to the space 20, wherein it laps the thermal transducer 27 (or 27').

If, for a reason whatever, the water temperature raises above the desired level, and a threshold level is reached, for example 50°C, i.e. the operative temperature level of the thermostatic elements 27 or 27', then the substance having its melting point at that level will melt and by expanding will cause the stem 26 to be displaced and the disk valve 24 to close, or alternatively, in the case of Figure 4, the bimetal disks are expanded like bellows and caused to trip and close the valve 24. This prevents a sudden delivery to the shower, and hence to the user, of excessively hot water. However, through the small hole 34, a small flow of water is maintained, which owing to the strong dissipation will never become dangerous, but which will permit the water in the dispensing set to be renewed, and accordingly the thermal element to be cooled as soon as the causes of the temperature excess are removed and the dispensing set is fed with water at the correct temperature, by suitably acting on the mixing valve 6.

The advantages of the invention are self-evident. From a technical standpoint, the main advantage resides in the simplicity of the device, and its elementary and absolutely repeatable physical principle, which ensures a quick action with a sufficient safety margin. Another remarkable advantage is the reduced bulk of the device, which permits its installation in existing faucet valve bodies with no or but minimal modifications.

Many modifications and variations may be introduced in the invention as described hereinabove. First and foremost, the inventive device may also be placed on the outlet spout, or on the common conduit, to prevent the delivery of excessively hot water to any directions. Furthermore, the device may be made to go out of action or become inoperative under the influence of a simple rod acting on the valve disk 24, in a direction and on the side opposite to the action of the thermostatic element. Moreover, the thermal element allows for the utmost freedom: rather than wax, the low-melting substance may be any other suitable one. For example, from a

physical point of view, a NaK (sodium-potassium) type of alloy, or similar, could be preferable, although it may be less recommendable due to its reactivity to water. Also utilized could be a liquid vapor change of state, employing the pressure variation at the change of state. In order to increase thermal transmissibility, the casing 28 could be formed with fins, and the wax could be crossed by wires in thermal contact with the walls.

These variations, and other similar ones, fall within the scope of this invention.

CLAIMS

1. A warm water delivery device, comprising warm water supply conduits, warm water delivery conduits and valve means between said supply and delivery conduits, wherein according to the improvement one of said warm water supply and delivery conduits has a valve seat in the interior thereof and defining a valve opening therein allowing water passage therethrough, a valve member cooperating with said valve seat to close and open said valve opening and thereby prevent or allow water passage therethrough, a temperature responsive thermostatic element within said one conduit near said valve member and operatively connected therewith to shift it in its closed position to prevent water passage therethrough when said water passing through said conduit has a temperature higher than a preestablished temperature level and maintain open said valve member when said water temperature is below said preestablished level.

2. A device according to Claim 1, further comprising a passage in said conduit by-passing said valve seat, said passage having a size substantially smaller than the opening of said seat to allow passage therethrough of a reduced rate of flow of water when said valve seat opening is closed.

3. A device according to Claim 1, further comprising resilient support means for said thermostatic element within said one conduit for allowing excess expansion thereof when said valve member is in its closed position.

4. A two-way switch and mixing valve faucet system comprising a mixing valve assembly, a cold water supply duct leading to said mixing valve assembly and a hot water supply duct leading into said mixing valve assembly, an outlet opening in said mixing valve assembly, a two-way switching valve unit having an inlet opening communicating with said outlet opening of said mixing valve assembly, a switching chamber communicating with said inlet opening, a switching valve member in said deviation chamber, a first delivery conduit opening into said switching chamber and leading towards a shower supply conduit and a second delivery conduit leading towards a spout wherein according to the improvement said shower supply conduit has a valve seat formation in the interior thereof and defining a valve opening therein allowing water passage therethrough, a valve member cooperating with said valve seat formation to alternatively close and open said valve opening and thereby alternatively prevent and allow water passage therethrough, a temperature responsive thermostatic element within said shower head conduit near said valve member and operatively connected therewith to shift it in its closed position to prevent water passage therethrough when said water passing through said shower head conduit has a temperature higher than a preestablished temperature level and maintaining open said valve member when said water temperature is below said preestablished level, a hole in said valve seat formation allowing passage of water therethrough when said valve seat opening is closed, said hole having a diameter substantially smaller than the diameter of said valve seat opening to allow passage of a reduced rate of flow of water therethrough when said valve seat opening is closed.

5. A warm water delivery device as herein before described with reference to and as illustrated in the accompanying drawings.

6. A two-way switch and mixing valve faucet system as herein before described with reference to and as illustrated in the accompanying drawings.

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